Disclosure

Options involve risks and are not suitable for all investors. Prior to buying or selling an option, an investor must receive a copy of Characteristics and Risks of Standardized Options. Copies are available from your broker or from The Options Clearing Corporation at www.theocc.com. Futures trading is not suitable for all investors and involves risk of loss. The information in this presentation is provided solely for general education and information purposes. No statement within this presentation should be construed as a recommendation to buy or sell a security or future or to provide investment advice. Any strategies discussed, including examples using actual securities or futures price data, are strictly for illustrative and educational purposes only. In order to simplify the computations, commissions, fees, margin interest and taxes have not been included in the examples used in this presentation. These costs will impact the outcome of all transactions and must be considered prior to entering into any transactions. Multiple leg strategies involve multiple commission charges. Investors should consult with their tax advisors to determine how the profit and loss on any particular option strategy will be taxed. Past performance does not guarantee future results. Supporting documentation for any claims, comparisons, statistics or other technical data in this presentation is available from Cboe upon request. Cboe Exchange, Cboe Volatility Index, CFE and VIX are registered trademarks and Cboe Futures Exchange, Cboe Short-Term Volatility Index, Cboe 3-Month Volatility Index, Cboe Mid-Term Volatility Index, Execute Success, SPX, The Options Institute VXST, VXV and VXMT are service marks of Cboe Global Markets, Incorporated (Cboe). S&P 500® is a registered trademark of Standard & Poor's Financial Services, LLC and has been licensed for use by Cboe and Cboe Futures Exchange, LLC (CFE). Cboe's and CFE's financial products based on S&P indices are not sponsored, endorsed, sold or promoted by S&P and S&P makes no representation regarding the advisability of investing in such products. This presentation should not be construed as an endorsement or an indication by Cboe of the value of any non-Cboe product or service described in this presentation.

Copyright © 2019 Cboe Global Markets. All rights reserved

The information provided in this communication is solely for educational purposes and should not be construed as advice or an investment recommendation. Fidelity Investments is a separate company, unaffiliated with Cboe Global Markets. There is no form of partnership, agency affiliation, or similar relationship between Cboe Global Markets and Fidelity Investments, nor is such a relationship created or implied by the information herein. Fidelity Investments has not been involved with the preparation of the content supplied by Cboe Global Markets and does not guarantee or assume any responsibility for its accuracy or completeness.
Topics – Session I

Index Options Basics
- Security Basics
- Trading & Settlement Characteristics
- Advantages
- How to Use Them

Volatility for Beginners
- Historical and Implied Volatility
- The VIX
- The importance of Timeframes and timing

Top Three Index Strategies
- Directional Trading: Buy a Call (market up)
- Directional Trading Buy a Put (market down)
- How to hedge your portfolio with the right Index
Index Options - Security Basics

- Options to buy or sell the value of underlying index
- No actual stocks bought or sold
- CASH SETTLE
- Typically “European-style options”
- Can be used to diversify portfolio
- Multiple ways to hedge portfolio risks
- Contracts usually have a multiplier of 100
  - E.g. SPX May17 2800 Put @ $26
  - Option price = $26 x 100 = $2,600

<table>
<thead>
<tr>
<th>Index</th>
<th>Index Options</th>
<th>Related ETF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DJIA</td>
<td>DJX</td>
<td>DIA</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>SPX (XSP)</td>
<td>SPY</td>
</tr>
<tr>
<td>NASDAQ 100</td>
<td>NDX</td>
<td>QQQ</td>
</tr>
<tr>
<td>Russell 2000</td>
<td>RUT</td>
<td>IWM</td>
</tr>
<tr>
<td>VIX</td>
<td>VIX</td>
<td>-</td>
</tr>
</tbody>
</table>
Index Option Basics - Trading & Settlement

- Underlying asset represents particular market
  - Cannot invest directly in index
  - Cash level of the Index adjusted by multiplier
    - E.g. SPX trading 2,800; notional value = $280,000 (2,800 x 100)

- A.M. Settlement
  - Based on opening prices
  - Settlement calculated from Friday morning opening prices
  - E.g. SPX, RUT, VIX, XSP, DJX, NDX

- P.M. Settlement
  - Based on closing prices
  - Settlement calculated from Friday afternoon closing prices
  - E.g. SPXW, OEX
Index Option Basics – Trading & Settlement (con’t)

European-style Options

- Most index options are European
- May only be exercised at expiration
- CASH SETTLE - No shares exchange hand
- Last day to trade Thursday before 3rd Friday
  - Non-standard trades until 3:00 p.m. CDT (e.g. SPXW)
- Settlement value determined Friday morning

American-style Options

- All optionable equity stocks and ETFs
- May be exercised at ANY time before expiration date
- Settlement in delivery of underlying shares
- Any option ITM by $0.01 is subject to auto-exercise
- Early Exercise reasons: Dividend (Call option), Bankruptcy (Put Option)
- Settlement price is official closing price for expiration
Index Options

- Settles with cash
- Contract value = Index value x $100 multiplier
- Some A.M. settle; Some P.M. settle
- Broad-based index options stop trading 3:15 p.m. CDT
- Mostly European-style exercise (OEX is American)
- Options may trade if components representing 80% of market cap trading in primary market
- Some special tax considerations – 1256 treatment

Equity Options

- Settles with shares of stock
- Denominated in shares
- P.M. settlement
- Options stop trading 3:00 p.m. CDT
- American-style exercise
- Options may trade only if underlying trading in primary market
- Some special tax issues
Index Option Basics - Advantages

- Ability to trade against diversified portfolio
  - Less volatility than individual stocks
  - Can protect index-correlated portfolio
- Large volume; Plenty of liquidity
- Large contract size tends to reduce cost (SPX/RUT)
  - SPX contract covers $280,000* of exposure
- No risk of disruption portfolio holdings at expiration
  - European exercise
  - No delivery of shares
- Receive Section 1256 Tax treatment¹
  - Regardless of holding period
  - Profits and losses: 60% long term and 40% short term
  - Positions marked-to-market at EOY and taxed as if closed

*Index value x 100 = 2800 x 100 = $280,000

¹ Investors should consult with their tax advisors to determine how the profit and loss on any particular option strategy will be taxed. Tax laws and regulations change from time to time and may be subject to varying interpretations.
Index Option Basics – How to Use Them

Trading with Index Options

- Offer a diversified portfolio of stocks to trade risk
- Speculation on the index going up or going down in a certain time frame
  - **Buy Call** – bullish on index
  - **Buy Put** – bearish on index
- Hedge a long portfolio of stocks by purchasing insurance
  - Sell Calls
  - **Protective Put**
What You Need to Know.....

- Options to buy/sell value of underlying index
- DJX, SPX, RUT and VIX are examples
- A.M./P.M. Settlements
- Most are European-style
- Cash settlement – no delivery of shares
- Some are very actively traded
- Ability to trade against diversified portfolio
- 1256 tax treatment\(^1\)
- Can be used to hedge portfolio or speculate

---

\(^1\) Investors should consult with their tax advisors to determine how the profit and loss on any particular option strategy will be taxed. Tax laws and regulations change from time to time and may be subject to varying interpretations.
Applying What You Learned.....
Topics – Session II

- Index Options Basics
  - Security Basics
  - Trading & Settlement Characteristics
  - Advantages
  - How to Use Them

- Volatility for Beginners
  - Historical and Implied Volatility
  - The VIX
  - The importance of Timeframes and timing

- Top Three Index Strategies
  - Directional Trading: Buy a Call (market up)
  - Directional Trading Buy a Put (market down)
  - How to hedge your portfolio with the right Index
Volatility for Beginners

- Volatility = Measure of the relative degrees of change
- Periods of relatively high volatility and low volatility
- S&P 500® Index volatility – 1-yr versus 5-yr
  - 2018: 4.92% monthly; 17.05% annual
  - 2013-2018: 3.82% monthly; 13.23% annual
- Ebbs and flows over time due to many factors

Volatility Drivers
- Geopolitical
- Corporate Earnings
- Stock-specific news
- Supply and Demand

- Volatility tends to be mean reverting
Reflects changes in underlying BUT does not imply a price trend
- Expectations change continually
Weather example – Chicago in July
- Average temperature: High - 81 degree, Low - 66 degree
- Average precipitation: 3.25 inches (9 days of rain)

Source: USA climate data
Historical and Implied Volatility

Historical Volatility (HV)
- Measure of changes in underlying from previous moves
- Factual data from past
- Measures how far traded prices move away from the mean
- Higher HV is indicative of a riskier asset – bullish and bearish
- No future guarantees

Implied Volatility (IV)
- Estimate of volatility based on market’s perception
- Represents the current market price for volatility
- Determined by prices of options of market forces
- Metric used to estimate future fluctuations in underlying price
- Proxy for market risk

HV frequently compared with IV to determine if options prices are over- or undervalued
Changing Implied Volatility: Example #1

- You buy XYZ Sept 50 call for $5.00
  - XYZ stock at $50.00
  - Expiration in 120 days
- Next day XYZ stock fluctuates (up $3/down $3) and levels off at $50
  - Sept 50 call increases in price to $5.50
- What happened?
  - IV of Sept 50 call increased
  - IV was 35% when purchased – IV is 40% the next day
  - Unrealized profit based on volatility
You buy XYZ Jun 55 call for $3.00

- XYZ stock at $50.00
- Expiration in 30 days

After 5 days XYZ stock *rises* to $51.50

- June 55 call *drops* in price to $2.50

What happened?

- IV of Jun 55 call *decreased*
- IV was 35% when purchased – IV is 30% after 5 days
- Unrealized *loss* based on volatility

<table>
<thead>
<tr>
<th>Stock Price</th>
<th>$50.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp/Strike</td>
<td>Jun 55 call</td>
</tr>
<tr>
<td>Opt. Price</td>
<td>$3.00</td>
</tr>
<tr>
<td>Vol</td>
<td>35%</td>
</tr>
<tr>
<td>DTE</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock Price</th>
<th>$51.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp/Strike</td>
<td>Jun 55 call</td>
</tr>
<tr>
<td>Opt. Price</td>
<td>$2.50</td>
</tr>
<tr>
<td>Vol</td>
<td>30%</td>
</tr>
<tr>
<td>DTE</td>
<td>25</td>
</tr>
</tbody>
</table>
Inverse Relationship

Average VIX in 2017: 11.09
Average VIX in 2018: 16.64
Average VIX in 2019: 15.51*

Data: Cboe Global Markets

*As of 5/3/2019
What is the VIX® Index?

- Index represents market’s expectation of 30-day forward looking volatility
- Derived from price inputs of S&P 500 index options
- Barometer of investor sentiment and market volatility
- VIX has paved the way for volatility as a tradeable asset
- Historically has inverse relationship with SPX
- Index is NOT an investable index
- VIX futures and options are tradeable vehicles
Relative Cost of Insurance

- Different perspective (Volatility is ever-changing)
  - Intrادay all-time high (Index): 89.53 (Oct 24, 2008)
  - Closing all-time high (Index): 80.06 (Nov 20 2008)

Source: Cboe Global Markets & Bloomberg
VIX futures & options afford market participants tremendous flexibility

- Pure play on expected volatility (higher/lower/neutral)
- Future price reflects market opinion of future VIX Index direction

VIX futures can trade at a premium (contango) or discount (backwardation) to the VIX Index

Typical futures trading strategies

- Outright Long VIX futures (market vol up directional play)
- Outright Short VIX futures (market vol down directional play)
- Calendar spreading (term structure play)

Futures are cash settled; typically expire on a Wednesday morning (A.M. settlement)

- Based on special settlement process for SPX options that expire 30 days out (from expiration)

VIX futures contract has $1,000 multiplier
VIX Futures Term Structure Matters – Understand It

- VIX options price off of indicative future
- **Backwardation/Inversion** – Fear driven market (Dec 2018 – January 2019)
- **Contango** – During periods of market stability (since February 2019)

Source: Cboe LiveVol
VIX Options Trading

- **CASH SETTLED** contracts that share an expiration date with a VIX future
- Priced off of corresponding futures contract with shared expiry – VERY IMPORTANT
  - Trading June VIX options; June VIX future determines
- VIX option strategies? Same as equity, ETF, and Index options strategies
  - Directional - Long calls or puts (spreads)
  - Structured spreads – Ratio spreads, Calendar spreads
  - VIX options widely used hedging vehicle for Institutional portfolios
- VIX options priced off futures contract, but settle into the VIX Index
- VIX options cease trading (typically) Tuesday P.M. before Wednesday A.M settle along with corresponding future

*VIX Options have a $100 contract multiplier*
Volatility exists for different timeframes
- 1-mo vol → 3-mo vol → 1-yr vol → 3-yr vol
- Be aware of current IV compared to past IV level
- Also know relevant IV compared to relevant HV (i.e. 3-mo IV vs. 3-mo HV)

Time-varied volatility measures can influence the expectations of investments
- Expectations are constantly in flux

Analyzing volatility by specified timeframes can be helpful
- Can reveal how a security has behaved in cycles or other events

Trying to time pivot points in the market (equity or volatility) is difficult
- Volatility tools (IV/HV timeframes) to help approximate potential pivot points
What You Need to Know.....

- Volatility measures degree of changes in underlying
- HV measure of past underlying changes
- IV is market’s forecast underlying changes
- Affect of IV on options pricing
- VIX Index – VIX Futures – VIX Options
- Understand VIX Term Structure
- VIX options prices determined by corresponding VIX future
- Time-varied volatility measures can influence expectations
Applying What You Learned.....
Topics – Session III

- Index Options Basics
  - Security Basics
  - Trading & Settlement Characteristics
  - Advantages
  - How to Use Them
- Volatility for Beginners
  - Historical and Implied Volatility
  - The VIX
  - The importance of Timeframes and timing
- Top Three Index Strategies
  - Directional Trading: Buy a Call (market up)
  - Directional Trading Buy a Put (market down)
  - How to hedge your portfolio with the right Index
Directional Trading – Buy a Call (market up)

- Investor that is bullish on S&P 500 index
  - Buy Call to potentially profit from rise in level
- Investor who wants to diversify short delta portfolio
  - Buy Call for upside exposure of S&P 500 index
- Investor that understands the advantage of options
  - Limited dollar risk
  - Leverage

![Diagram showing Profit Potential, Loss Potential, Strike Price, and Volatility]

- **Profit Potential:** Unlimited
- **Loss Potential:** Limited
- **Strike Price**
- **Break-Even Point:** Strike + Premium
- **Volatility:**
  - Increase = Positive Effect
  - Decrease = Negative Effect
- **Time Decay:**
  - Negative Effect

Volatility: Increase = Positive Effect
Decrease = Negative Effect

Time Decay:
Negative Effect
Directional Trading – Buy a Put (market down)

- Investor who is bearish on S&P 500 index
  - Buy Put to potentially profit on decline in level
- Investor wants to speculate on market drop
  - Buy Put for downside exposure to S&P 500
- Investor that understands the advantage of options
  - Limited dollar risk
  - Leverage

Diagram:
- Profit Potential: Significant
- Loss Potential: Limited
- Break-Even Point: Strike - Premium

Volatility:
- Increase = Positive Effect
- Decrease = Negative Effect

Time Decay:
- Negative Effect
Determine # of SPX contracts:

Portfolio $Value to be Hedged

Notional Value of Index Contract (Strike x $100)

\[
\frac{\$500,000}{2800 \times \$100} = 2 \text{ SPX Puts}
\]

Buy 2 SPX January 2800 Puts @ $100 (Total $20,000 – 4% of portfolio)
$500,000
SPX @ 2,800
Buy 2 SPX January 2800 Puts $100
Cost = 2 x 100 x $100 = $20,000
1 SPX Put protects $280,000
Strike price is at-the-money
Assume SPX at 2,240
Market is down 20% so Portfolio is down 20%
$480,000 stock portfolio is now $384,000

But since we hedged:
SPX 2,240 → 2,800 puts $560
Value of Puts: $560 × 2 × 100 = $112,000
Portfolio: Value of Equities + Value of 2800 strike puts
Total Portfolio Value: $384,000 + $112,000 = $496,000

Due to hedging:
Market down 20% but Portfolio ONLY down 0.8%
Any Questions?!?!